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10/673,733	09/29/2003	Amiram Hayardeny	IL920030031US1	1932

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EXAMINER	
KIM, PAUL	
ART UNIT	**PAPER NUMBER**
2161	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/673,733	HAYARDENY ET AL.	
	Examiner	Art Unit	
	Paul Kim	2161	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-60* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action is responsive to the following communication: Amendment filed on 3 January 2007.

2. Claims 1-60 are pending and present for examination. Claims 1, 21, 30, and 41 are independent.

Double Patenting

3. As per the nonstatutory double patenting rejection, Applicant's terminal disclaimer is acknowledged. Accordingly, the rejection has been withdrawn.

Terminal Disclaimer

4. The terminal disclaimers filed on 3 January 2007 and 18 January 2007 disclaiming the terminal portion of any patent granted on this application have been reviewed and is accepted. The terminal disclaimers have been recorded.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. **Claims 1, 3, 5, 10, 21, 23, 25, 30, 41, 43, 45, and 50** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The aforementioned claims contain

conditional "if" statements which fail to affirmatively recite that the method steps would take place.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. **Claims 1-12, 18-20, 21-32, 38-40, 41-52, and 58-60** are rejected under 35 U.S.C. 102(b) as being anticipated by Yanai et al (U.S. Patent No. 5,742,792, hereinafter referred to as Yanai), filed on 28 May 1996, and issued on 21 April 1998.

9. **As per independent claims 1, 21, and 41,** Yanai teaches:

A method for managing a data storage system that includes primary and secondary storage subsystems, including respective first and second non-volatile storage media, the method comprising:

maintaining a bitmap record on the secondary storage subsystem, which is predictive of locations to which data are to be written on the primary storage subsystem by a host processor {See Yanai, C11:L15-30, wherein this reads over "the present system maintains a list or index, utilizing one or more flag bits, in a hierarchical structure, on each physical and logical data storage device" and "each data storage system maintains an indication of write or copy pending 102 of both the primary data (M!) 104, and the secondary data (M2)"; and C12:L6-7, wherein this reads over "each data storage device keeps data validity information about its mirrored device}, the record including a designation of locations to which the host is expected to write in the near future;

receiving at the primary storage subsystem, from the host processor, the data to be written to a specified location on the first non-volatile storage media {See Yanai, C11:L31-34, wherein this reads over "when a host computer writes data to a primary data storage system, it sets both the primary and secondary bits 104, 106 of the write pending bits 102 when data is written to cache"};

when the specified location is not included in the record, sending a message from the primary storage subsystem to the secondary storage subsystem so as to cause the secondary storage subsystem to update the record {See Yanai,

C12:L6-21, wherein this reads over "every new write command goes to the accessible mirrored device along with information that the not accessible device has a track which is not valid" and "when a specific track is not shown on both the primary and secondary storage system, an indication of such will be assigned"};

signaling the host processor that the data have been stored in the data storage system responsively to receiving the data and, when the specified location was not included in the record, responsively to receiving an acknowledgment at the primary storage subsystem from the secondary storage subsystem indicating that the record has been updated {See Yanai, C15:L36-43, wherein this reads over "[t]he data storage system containing the primary (R1) volume informs the host that an I/O sequence has successfully completed only after the data storage system containing the secondary (R2) volume acknowledges that it has received and checked the data"}; and

storing the data in the specified location on both the first and second non-volatile storage media {See Yanai, C11:L37-43, wherein this reads over "[w]hen the primary data storage system controller's disk adapter writes the data to the primary data storage device" and "[o]nce the secondary data storage system has written the data"}.

10. **As per dependent claims 2, 22, and 42,** Yanai teaches:

The method according to claim 1, wherein sending the message comprises copying the data synchronously from the primary storage subsystem to the secondary storage subsystem {See Yanai, C15:L36-39, wherein this reads over "data on the primary (R1) and secondary (R2) volumes are always fully synchronized at the completion of an I/O sequence"}.

11. **As per dependent claims 3, 23, and 43,** Yanai teaches:

The method according to claim 2, wherein storing the data comprises, when the specified location is included in the record, copying the data from the primary storage subsystem to the secondary storage subsystem asynchronously, without updating the record with respect to the specified location {See Yanai, C2:L58-65, wherein this reads over "asynchronously with the primary host computer requesting the writing of data to the primary data storage system"}.

12. **As per dependent claims 4, 24, and 44,** Yanai teaches:

The method according to claim 3, wherein copying the data comprises transmitting the data between mutually-remote sites over a communication link between the sites {See Yanai, C5:L16-20, wherein this reads over "the remote mirroring facility is provided with a migration mode which is active during host processing of a primary (R1) volume and iteratively copies updates from the primary (R1) volume to a secondary (R2) volume"}.

13. **As per dependent claims 5, 25, and 45,** Yanai teaches:

The method according to claim 3, wherein maintaining the record comprises maintaining a copy of the record on the primary storage subsystem, and wherein signaling the host processor comprises, the specified location is

included in the record, indicating to the host processor that the data have been stored without waiting to receive the acknowledgment from the secondary storage subsystem {See Yanai, C3:L43-48, wherein this reads over "[t]he data storage system containing the primary (r1) volume informs the host that an I/O sequence has successfully completed without waiting for the data storage system containing the secondary (R2) volume to acknowledge that it has received and checked the data"}.

14. **As per dependent claims 6, 26, and 46,** Yanai teaches:

The method according to claim 1, wherein copying the data comprises creating a mirror on the secondary storage subsystem of the data received by the primary storage subsystem {See Yanai, C58-65, wherein this reads over "the remote data copying or mirroring is completely independent of and transparent to the host computer system"}.

15. **As per dependent claims 7, 27, and 47,** Yanai teaches:

The method according to claim 6, and comprising, upon occurrence of a failure in the primary storage subsystem, configuring the secondary storage subsystem to serve as the primary storage subsystem so as to receive further data from the host processor to be stored by the data storage system {See Yanai, C17:L39-44, wherein this reads over "Under the abnormal condition of the data being entirely absent from the data storage system due to a disk drive failure, however, a request for data access to a primary (R1) volume can be satisfied by obtaining the requested data from the secondary volume (R2) in the remote data storage system"}.

16. **As per dependent claims 8, 28, and 48,** Yanai teaches:

The method according to claim 6, and comprising, upon recovery of the system from a failure of the primary storage subsystem, conveying, responsively to the record, a portion of the data from the secondary storage subsystem to the primary storage subsystem for storage on the primary storage subsystem {See Yanai, C27-L56-59, wherein this reads over "[w]hen the defective disk device is replaced, the data storage system re-synchronizes the mirrored pair, automatically copying data to the new disk"}.

17. **As per dependent claims 9, 29, and 49,** Yanai teaches:

The method according to claim 1, wherein maintaining and updating the record comprise marking respective bits in a bitmap corresponding to the locations to which the data are to be written on the first and second non-volatile storage media {See Yanai, C35:L22-61}.

18. **As per independent claims 10, 30, and 50,** Yanai teaches:

A method for managing a data storage system that includes primary and secondary storage subsystems, including respective first and second non-volatile storage media, the method comprising:

maintaining a record on the secondary storage subsystem, which is predictive of locations to which data are to be written on the primary storage subsystem by a host processor, wherein maintaining the record comprises maintaining a copy of the record on the primary storage subsystem {See Yanai, C11:L15-30, wherein this reads over "the present system maintains a list or index, utilizing one or more flag bits, in a hierarchical structure, on each physical and logical data storage device" and "each data storage system maintains an indication of write or copy pending 102 of both the primary data (M!) 104, and the secondary data (M2)"; and C12:L6-7, wherein this reads over "each data storage device keeps data validity information about its mirrored device};

receiving at the primary storage subsystem, from the host processor, the data to be written to a specified location on the first non-volatile storage media {See Yanai, C11:L31-34, wherein this reads over "when a host computer writes data to a primary data storage system, it sets both the primary and secondary bits 104, 106 of the write pending bits 102 when data is written to cache"};

if the specified location is not included in the record, sending a message from the primary storage subsystem to the secondary storage subsystem so as to cause the secondary storage subsystem to update the record, wherein sending the message comprises deciding at the primary storage subsystem to send the message responsively to the copy of the record, {See Yanai, C12:L6-21, wherein this reads over "every new write command goes to the accessible mirrored device along with information that the not accessible device has a track which is not valid" and "when a specific track is not shown on both the primary and secondary storage system, an indication of such will be assigned"}, and wherein sending the message comprises deciding at the primary storage subsystem to send the message responsively to the copy of the record;

signaling the host processor that the data have been stored in the data storage system responsively to receiving the data and, if the specified location was not included in the record, responsively to receiving an acknowledgment at the primary storage subsystem from the secondary storage subsystem indicating that the record has been updated {See Yanai, C15:L36-43, wherein this reads over "[t]he data storage system containing the primary (R1) volume informs the host that an I/O sequence has successfully completed only after the data storage system containing the secondary (R2) volume acknowledges that it has received and checked the data"}; and

storing the data in the specified location on both the first and second non-volatile storage media. {See Yanai, C11:L37-43, wherein this reads over "[w]hen the primary data storage system controller's disk adapter writes the data to the primary data storage device" and "[o]nce the secondary data storage system has written the data"}.

19. **As per dependent claims 11, 31, and 51,** Yanai teaches:

The method according to claim 10, wherein sending the message comprises modifying both the record and the copy of the record responsively to the specified location {See Yanai, C11:L31-43, wherein this reads over "When the primary data storage system controller's disk adapter writes the data to the primary data storage device, it will reset bit 104 of the write pending indicator bits 102. Similarly, once the secondary data storage system has written the data to the secondary data storage device, the secondary data storage write pending indicator bit 106 will be reset"}.

20. **As per dependent claims 12, 32, and 52,** Yanai teaches:

The method according to claim 11, wherein modifying both the record and the copy of the record comprises adding a plurality of locations, including the specified location, to both the record and the copy of the record {See Yanai, C11:L31-35, wherein this reads over "when a host computer writes data to a primary data storage system, it sets both the primary and secondary bits 104, 106 of the write pending bits 102 when data is written to cache"}.

21. **As per dependent claims 18, 38, and 58,** Yanai teaches:

The method according to claim 1, wherein sending the message causes the secondary storage subsystem to designate one or more further locations to which the host processor is expected to write the data in a subsequent write operation, and to add the one or more further locations to the record {See Yanai, C25:L16-61}.

22. **As per dependent claims 19, 39, and 59,** Yanai teaches:

The method according to claim 18, wherein the one or more further locations comprise a predetermined number of consecutive locations in proximity to the specified location {See Yanai, C40:L3-5, wherein this reads over "The preferred format for the information in the link buffer 505 is a string of track and record identifications and indications of where the records are found in the cache 228"}.

23. **As per dependent claims 20, 40, and 60,** Yanai teaches:

The method according to claim 18, wherein maintaining the record comprises recording the locations to which the data are written using an object-based storage technique, and wherein the one or more further locations are chosen based on a logical connection between storage objects {See Yanai, C3:L25-29, wherein this reads over "The operating mode for each logical volume can be specified to best suit the purposes of the desired remote mirroring, the particular application using the volume, and the particular use of the data stored on the volume"}.

Claim Rejections - 35 USC § 103

24. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject

matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

25. **Claims 13-14, 33-34 and 53-54** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanai, in view of Dunham (U.S. Patent No. 6,269,431), filed on 13 August 1998, and issued on 31 July 2001.

26. **As per dependent claims 13, 33 and 53**, Yanai, as modified by Dunham, discloses:

> The method according to claim 10, wherein maintaining the copy of the record comprises selecting one or more locations, other than the specified location, to be removed from the record, and instructing the secondary storage subsystem to remove the one or more locations from the record, so as to limit a size of the record {See DUNHAM, C17:L67-C18:L4, wherein this reads over "[u]pon completion of a file deletion command, the secondary data storage subsystem would return an acknowledgment to the host, and the host could update its catalog to reflect deletion of the files from the back-up version of the file system"}.

While Yanai may fail to expressly disclose the instructing of the second storage subsystem to remove locations from a record, the combination of inventions disclosed in Yanai and Dunham would disclose an invention which removed one or more locations from the record. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above invention suggested by Yanai by combining it with the invention disclosed by Dunham.

One of ordinary skill in the art would have been motivated to do this modification so that the size of the record may be limited by archiving and purging unnecessary entries from the record. In addition, Yanai and Dunham are analogous art because they belong to the same field of endeavor, such as, back up and mirroring data between a plurality of storage devices, memory allocation, and database management systems.

27. **As per dependent claims 14, 34 and 54**, Yanai, as modified by Dunham, discloses:

> The method according to claim 13, wherein storing the data comprises copying the data to be stored in the one or more locations from the primary storage subsystem to the secondary storage subsystem {See Yanai, C1:L30-38, wherein this reads over "the copying of the primary data to a secondary data storage system controller which forms part of a secondary data storage system"}, and

wherein selecting the one or more locations comprises receiving a return message from the secondary storage subsystem indicating that the secondary storage subsystem has received the copied data {See Yanai, C15:L36-43, wherein this reads over "[t]he data storage system containing the primary (R1) volume informs the host that an I/O sequence has successfully completed only after the data storage system containing the secondary (R2) volume acknowledges that it has received and checked the data"}, and

selecting the one or more locations to be removed from the record responsively to the return message {See DUNHAM, C17:L38-C18-24, wherein this reads over "[t]he procedure, for example, deletes files of the file system that have expired or that a user or application program did not request to be backed up" and "the back-end data mover updates the secondary directory to refer to the new, compacted file system and thereby delete the original backup version of the file system"}.

While Yanai may fail to expressly disclose the selection of locations to be removed from the record responsively to the return message, the combination of inventions disclosed in Yanai and Dunham would disclose an invention which selected one or more locations from the record for removal. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above invention suggested by Yanai by combining it with the invention disclosed by Dunham.

One of ordinary skill in the art would have been motivated to do this modification so that the size of the record may be limited by archiving and purging selected entries from the record. In addition, Yanai and Dunham are analogous art because they belong to the same field of endeavor, such as, back up and mirroring data between a plurality of storage devices, memory allocation, and database management systems.

28. **Claims 15-17, 35-37 and 55-57** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanai, in view of Dunham, and in further view of Official Notice.

29. **As per dependent claims 15, 35 and 55**, it would have been obvious to one of ordinary skill in the art at the time the invention was made to identify locations containing identical data since multiple copies of identical data need not be stored in multiple locations. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

remove the location which was least-recently added so that the least-current location containing the identical data may be discarded.

30. **As per dependent claims 16, 36 and 56**, it would have been obvious to one of ordinary skill in the art at the time the invention was made to group the entries added to the copy of the record and the record in generations so that the generations, or versions, of entries may be used in discarding entries of a certain generation or version using a batch method.

31. **As per dependent claim 17, 37 and 57**, it would have been obvious to one of ordinary skill in the art at the time the invention was made to append an instruction to the message sent from the primary storage subsystem to the secondary storage subsystem, so that the appended instruction may be used in providing the secondary storage subsystem with the instructions to remove the locations.

Response to Arguments

32. Applicant's arguments with respect to claims 1-60 have been considered but are moot in view of the new ground(s) of rejection.

33. Additionally, it is noted that Applicant has failed to adequately traverse the rejections of claims 15-17, 35-37 and 55-57 in view of the Examiner's Official Notice. Applicant states on page 9 of Applicant's Amendment that "[f]or the sake of brevity, however, Applicants will refrain from arguing the independent patentability of the dependent claims." Therefore, the Examiner's assertion of Official Notice is taken to be admitted prior art since Applicant has failed to adequately the Examiner's assertion of Official Notice. See MPEP 2144.03, Subsection C.

Conclusion

34. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

35. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul Kim whose telephone number is (571) 272-2737. The examiner can normally be reached on M-F, 9am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Apu Mofiz can be reached on (571) 272-4080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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